Certain Roentgen Manifestations of Gastric Lesions*

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IT is attempted here to review certain features of the roentgenologic aspects of gastric disease, starting from rather broadly defined manifestations, considering lesions which might produce them, and circumstances in which diagnosis may remain obscure. Differentiations of types of lesions usually are possible in the majority of cases. At times lesions are not roentgenologically distinctive. The limitations of this method of examination must be recognized.

The literature contains practically all that might be said on the subject. Roentgen examinations have been made more elaborate and have been improved by mucosal relief studies and other refinements. Gastroscopy has become more freely available, though not yet to the extent that is desirable.

Recent correlations of roentgenologic, gastroscopic, surgical and pathologic findings indicate that the conclusions of the gastroscopist and/or the roentgenologist may be incorrect. The surgeon at operation may be dependent upon the histologic findings for the correct diagnosis. Since the possibility of gastric carcinoma is to be considered in so many cases, and since after many years sufficient progress has not been made in recognizing it usefully early, the problem requires continual reconsideration.

The *niche*, excluding its incidental simulants, indicates ulcer. A question most insistently asked of the radiologist is whether the ulcer is benign or malignant.

The niche of typical benign ulcer has one of the most "characteristic" appearances encountered in gastro-intestinal roentgenology. The smooth margined protrusion from a usually broader base, ending in a rounded, flat or bluntly conical floor and the apparent projection of the niche beyond the confines of the stomach are classical. (Figure 1.) There may be marginal encroachment by inflammatory thickening of the gastric wall or radiating folds of scarred contraction.

Although it is well known that any such ulcer may be carcinomatous, so many of these are seen to disappear promptly on serial studies during medical ulcer management, that it is difficult to avoid the temptation to report them as benign. The radiologist may report them as having no roentgenologic criteria of malignancy, but this fact does not exclude carcinoma. This is superfluous warning to the surgeon and gastro-enterologist, but not to the physician who encounters ulcers incidentally in a busy, varied practice.

Gastroscopy may serve a useful purpose to rule out malignancy not evident to the radiologist. Before healing is considered to be complete, disappearance of the lesion should be established by both methods if possible. Ulcer may disappear to roentgen observation before it does to gastroscopic observation. Schindler has decried the use of the trial of healing.[9] There have been warnings that carcinomatous ulcers may diminish or apparently disappear under a medical ulcer regime. Because of the possibility that a niche may not be apparent on a single roentgen examination, persistent disappearance of the lesion must be established.

Criteria of malignancy of ulcer are more reliable than those of benignity. The meniscus sign, properly understood, appears almost pathognomonic. Kirklin[8] was incited to review the situation because of confusion on the subject. A basal collar of neoplastic tumefaction produces the negative shadow meniscus, when seen tangentially, or a "halo" when seen *en face*. Equally important as a sign indicating malignancy, the niche itself must remain within the projected outline of the stomach. (Figure 2.)

Raggedness of walls and floor of the ulcer and irregular tumefaction about it point to malignancy, though occasionally these signs will fail.

Prepyloric location of an ulcer is reason for added suspicion of malignancy. Exceptional size has become somewhat discredited as an indication of malignancy. It is fair, however, to view the large

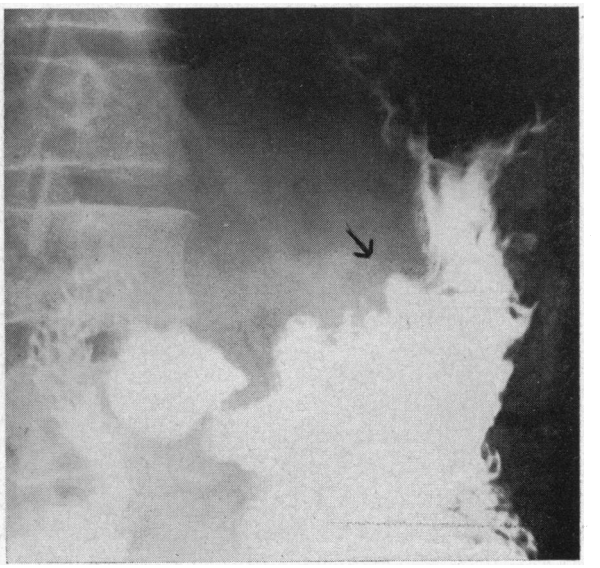

Figure 1.—Classical benign ulcer with radiating gastric folds.

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ulcer with added suspicion. Ulcers on the greater curvature are usually carcinomatous, but may prove to be benign in spite of exceptionally ragged outlines.

One type of niche occurs in the center of tumors such as leiomyosarcoma or fibrosarcoma. These lesions usually produce a spheroidal tumor not materially deforming the adjacent stomach or impeding its peristalsis. The mass may grow externally and not encroach upon the stomach or do so only by an appearance of extragastric pressure, leaving intact rugae so that the central ulcer resembles a benign peptic one. (Figure 3.)

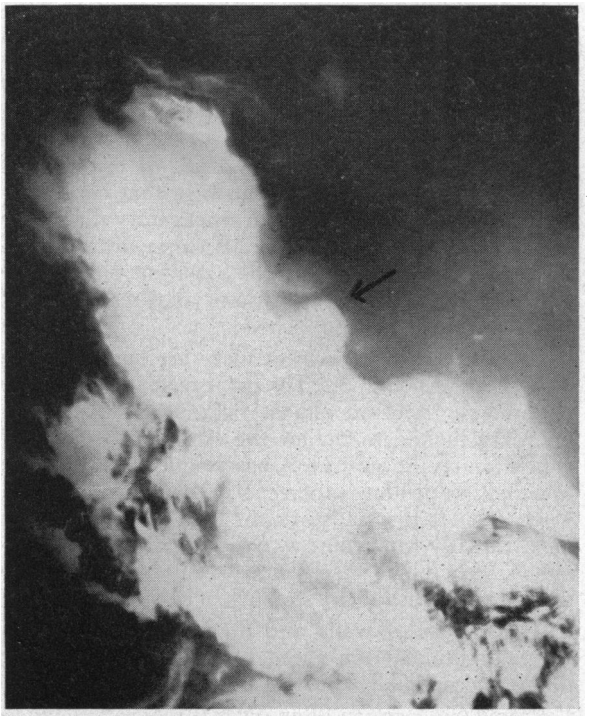

Figure 2.—Ulcerative carcinoma. Partial meniscus sign lacking the negative shadow because of marked surrounding tumefaction but revealing the indispensable part that the floor of the ulcer lies within the projected contour of the stomach. The niche itself has the classical appearance of benign ulcer.

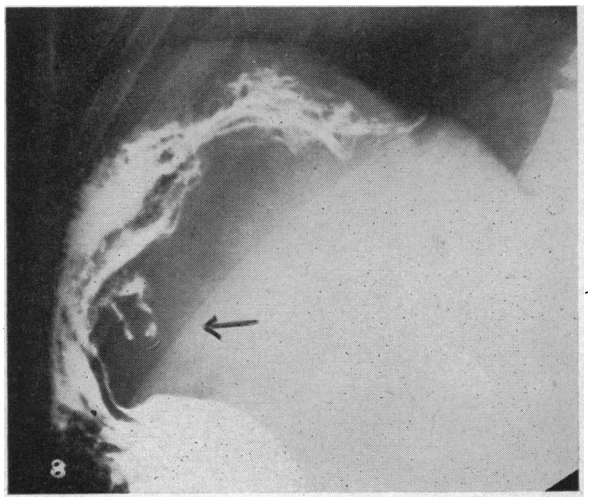

Figure 3.—Leiomyosarcoma, the main neoplastic mass giving the appearance of extragastric pressure. The central niche projects amid intact rugae, resembling benign ulcer.

Isolated spheroidal lesions usually appear as negative shadows in a region of the stomach, otherwise unmodified as to contour, mucosal pattern, or peristaltic activity. These are usually benign tumors or polyps, although their present or eventual benignity is always a matter of doubt. (Figure 4.) Irregularity of contour of the mass or changes in the adjacent gastric wall are points for malignancy, as is a niche or button of central necrosis.

A *multilobular deformity* may be due to polyposis, carcinoma or sarcoma, particularly lymphosarcoma. Swollen, stiffened rugae of gastritis may give this appearance. The deformities of carcinoma are irregular and there is much stiffening of the stomach. Peristalsis is either absent or grossly impaired. Local lesions are seen which cannot be diagnosed prior to operation or to biopsy. Lymphosarcoma or reticulum cell sarcoma are not usually distinguishable from carcinoma but are apt to have greater flexibility.

The classical cobble-stone appearance of polyposis *en nappe* may be given by gastritis which subsides completely so that at later autopsy the stomach appears entirely normal.

Rugal enlargement and distortion may be local or generalized and present several diagnostic possibilities. General rugal enlargement as an indication of hypertrophic gastritis has been much discredited by gastroscopy. Coarse rugae seen by the radiologist may, on gastroscopic observation, be found to represent no recognizable disease or may, in fact, be associated with atrophic gastritis. Nevertheless they

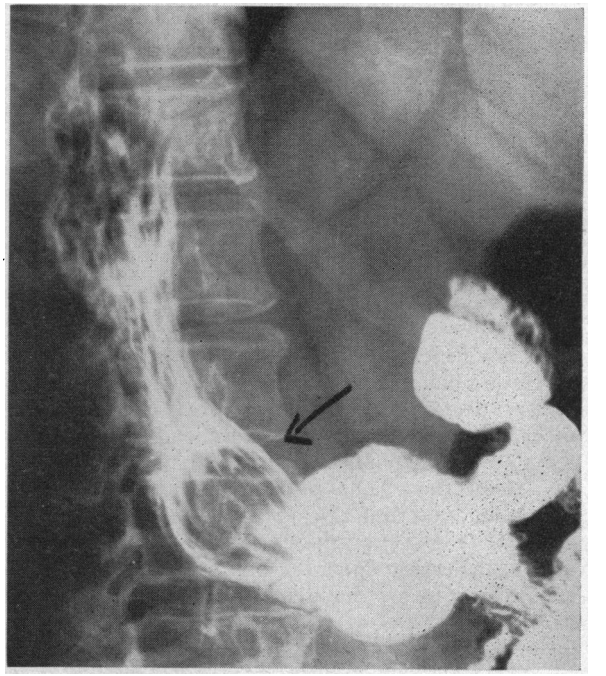

Figure 4.—Leiomyoma, spheroidal mass not impairing peristalsis, rugal pattern or gastric contour.

may represent gastritis. The rugae seen by the gastroscopist may be very different from those seen by the radiologist, since the two methods display them under different conditions of gastric distention.

Lymphosarcoma may spread submucously, producing an enlarged distorted rugal pattern with preservation of peristalsis and flexibility.

Multiple polyposis may present either a lobulate or rugose appearance or a combination of them.

Gastric retention may vary from a minor delay in emptying to that of true obstruction. The latter condition is represented by practically complete prolonged retention and dilation of the stomach.

The most frequent causes are duodenal ulcer, with scarring and stenosis, and carcinoma involving the pylorus. Pyloric and prepyloric spasm alone are infrequently sufficiently intense and persistent to cause true obstruction. Adhesions about the duodenum and pylorus have caused it. In one instance a minute ulcerated leiomyoma at the pylorus caused it, apparently by combined partial obstruction and intense spasm.

The cause of obstruction is frequently difficult to identify roentgenologically. Pyloric carcinoma may leave no recognizable defect. Sufficient barium may not enter the duodenum to outline ulcer. A thorough lavage campaign to clear the stomach and to reestablish better tonus are essential for useful study. Successful lavage may be difficult because of combined food and secretion and requires persistence.

The majority of instances of gastric retention are partial and result from an impairment of the active emptying mechanism, not truly obstructive. They frequently occur when the immediate emptying is rapid. Causes are numerous, in and out of the gastrointestinal tract. They include peptic ulcer, with or without frank pylorospasm; gastric carcinoma without obstruction; gastro-enterostomy, even when there is an adequate stoma; asthenia, and numerous reflex conditions.

Cole[3] contended that the duodenum was the pacemaker of gastric evacuation. Gershon-Cohen[4] recently has drawn similar more detailed conclusions from experimental study. Non-obstructive retentions call for renewed vigilance in gastro-intestinal examination but are not of great differential value. Proper respiratory excursion has a role in gastric emptying.[7] Paralysis of the left diaphragm may be associated with retention.

Prepyloric deformities are so frequent and confusing that they should be considered separately. These have been discussed regionally by Camp,[2] Stone and Ruggles,[10] Golden,[5] and by most texts on gastro-intestinal roentgenology.[6,11]

Causes for these deformities include ulcer with or without a frank niche, gastritis, spasm, benign tumor, polyposus, lymphosarcoma, and extrinsic pressure.

Whatever the type of these deformities differential points with regard to them include preservation, impairment or absence of peristalsis, rugal pattern and flexibility; presence or absence of palpable mass, and association with a normal or deformed duodenal bulb.

Gastric carcinoma in this region conventionally results in inflexibility, loss of mucosal pattern and of peristalsis and the presence of palpable mass, so that these associated findings, regardless of the type of deformity, usually make the diagnosis. With deviation from this, other diagnoses are to be considered, though carcinoma is not necessarily excluded.

The *prepyloric annular deformity* may be due to carcinoma, ulcer, spasm, gastritis, extrinsic pressure or syphilis. Rugal markings within the annular zone are frequently used to exclude carcinoma. However, some mucosa may remain undestroyed[2,5] (Figure 5). Further, the carcinoma may grow predominantly extra-gastrically, with some preservation of mucosal

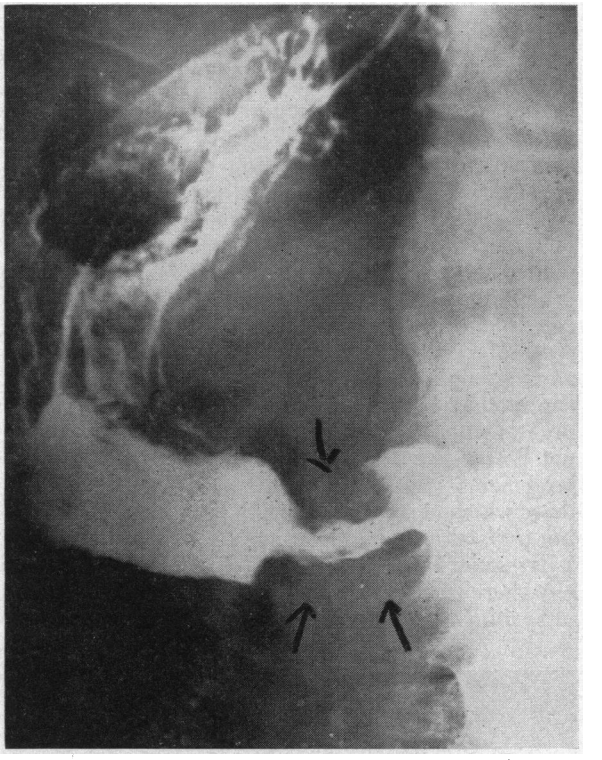

Figure 5.—Carcinoma with partial preservation of mucosal pattern.

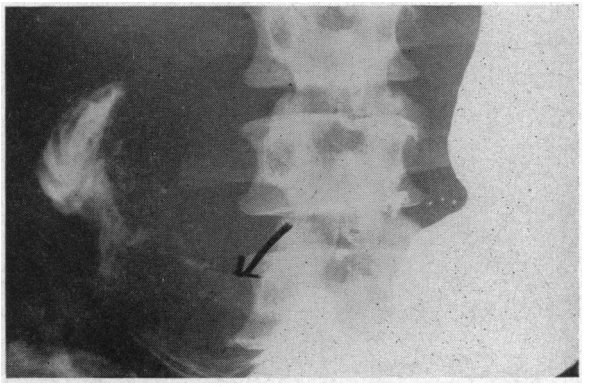

Figure 6.—Carcinoma, the growth predominantly to the lesser curvature side giving the appearance of extragastric pressure. Preservation of rugal pattern.

markings and an appearance of external pressure. (Figure 6.) Peristalsis may not be entirely obliterated, creating the impression of a benign lesion.[5]

Contrariwise in the presence of antral gastritis, the gastric wall may be thickened and stiffened by edema and infiltration impairing flexibility, peristalsis, and the mucosal relief.

Intense prepyloric spasm alone may produce annular constriction so persistent and marked that the region appears stiffened, and no mucosal relief or peristalsis is observed. Reexamination after lavage and antispasmodics may reveal the temporary character of the manifestation. The duodenum in such cases frequently reveals ulcer.

The peculiarly smooth prepyloric constriction of syphilis produces a rather characteristic appearance. That disease is relatively infrequent, however, and the diagnosis should be made with reservation.

A lobular encroachment upon the prepyloric lumen may be caused by polyps (Figure 7), benign tumors, carcinoma or rugal thickening of gastritis. In the presence of spasm, normal or nearly normal rugae in distorted arrangement may give a somewhat polypoid appearance, which observation with palpation will usually clarify. Flexibility and peristalsis are usually well maintained. Carcinoma partially or completely eliminates peristalsis and flexibility. Rugose types of gastritis may partially eliminate these also and may simulate carcinoma closely. Some medullary carcinomas may show surprising flexibility. Even tumors with preserved flexibility and peristalsis cannot be trusted to be or remain benign. Rugose enlargements which are highly flexible, particularly those which herniate through the pylorus with emptying peristaltic rush, are usually quite characteristic.

Irregularity of the surface of polypoid masses as elsewhere suggests malignancy, as do residual flecks of barium at their surfaces. This, however, may occur also in superficial ulcers on the surface of the gastric walls thickened by gastritis.

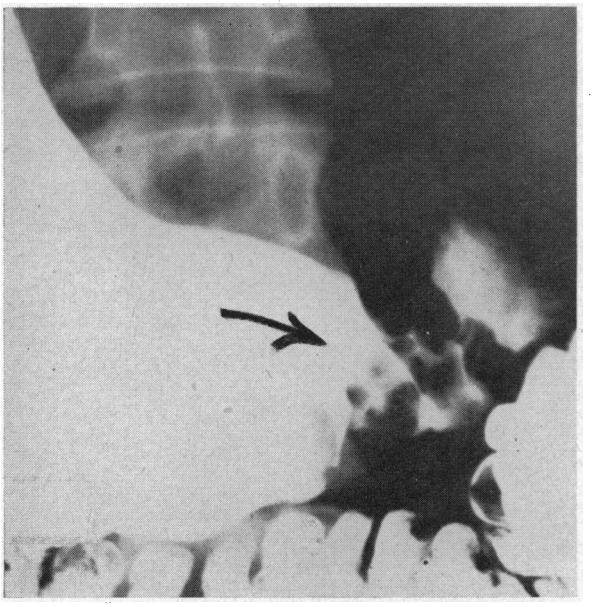

Figure 7.—Prepyloric multiple polyposus.

Figure 8.—Prepyloric gastritis and a shallow erosive ulcer. A plaque-like carcinoma 24 mm. diameter, 10 mm. thick overlaid by flattened but intact mucosa was in the body of the stomach. This might have escaped detection under most detailed examination but only by careful rugal study in this region could it have been recognized. The carcinoma is not evident on this film.

An eccentric relation of the narrowed prepylorus to the pylorus has varied causes. It may be due to eccentric growth of neoplasm or to extrinsic pressure. (Figure 6.) In either case the encroachment may be from the greater or lesser curvature side. It may be associated with a frank niche of ulcer.

The association of a frank niche to prepyloric deformity usually narrows the field to benign or carcinomatous ulcer.

Prepyloric deformity of spastic or gastritic type cannot lightly be assumed to be the primary lesion present. Careful examination of the remainder of the stomach, where obscure peptic ulcer or carcinoma may be present, is called for. Undue concentration of attention upon this region may result in failure to recognize an important lesion elsewhere. (Figure 8.) There may always be multiple lesions.

Deformity at the cardia may occur from carcinoma or from extragastric pressure. The rugal pattern in this region is particularly confused. A factor in this is the fact that frequently a significant length of the stomach lies beneath the diaphragm so that the pattern is one of multiple rugae projected tangentially one over another. Palpation is not available except indirectly. For this reason, ulcers in this region are particularly obscure. Carcinoma may produce frank intrusive mass or may result in diffuse constriction in which the rugal pattern persists at least partially. Observation of the shape and flexibility of the cardia by means of its air-bubble during respiration is of assistance. Kirklin has emphasized this and has also pointed out that the lesion may be suspected from a deformity of the stomach-bubble seen on roentgenograms of the chest. Extension of cardiac carcinoma into the distal end of the esophagus is common.

The foregoing is a partial description of some of the limitations of gastric roentgenology, with emphasis upon conditions in which findings are incon-

clusive. Means of decreasing this inconclusiveness need not be detailed here. They have been described and advocated by many authors. Painstaking and repeated examinations employing rugal and compression studies, observation in varied projections, often after lavage and antispasmodics, are indicated.

Sharp increases in the manpower and time available for such examinations are required. In high grade private practice of radiology and in strong university hospitals, such conditions are most nearly met. The radiologist cannot, at the same time concentrate on examining the greatest possible number of cases and upon giving each the maximum of thoughtful attention. These two requirements are mutually exclusive.

Well trained radiologists are on the whole capable of performing the type of examination needed. Whether they will actually do so will depend upon whether a sufficient number of them are so employed, with adequate technical support and equipment.

The radiologist, having gone as far as possible, is then obligated to present and evaluate his evidence somewhat conservatively, drawing the warranted conclusions but not permitting his desire to make a definitive diagnosis to lead him to press his evidence to more definite conclusions than it actually supports.

Recognition of true early gastric carcinoma is a separate problem. It has been well stated by Abrahamson and Hinton [1] as the problem of recognizing presymptomatic cancer. This calls for laboriously done examinations on a mass survey plan and requires provision for far greater manpower and facilities than are now available, if there is to be a significant effect on the prognosis of cancer of the stomach.

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QUESTIONS AND ANSWERS

DR. CARTER: "What is the present status of clinical diagnosis of duodenitis, including x-ray findings?"

Insufficient numbers of cases come to pathologic proof to erect a clear clinical syndrome. One can assume there are rather non-specific symptoms such as might occur from gastro-intestinal disorders generally, particularly peptic ulcer.

Roentgenologically, Kirklin has described duodenitis critically and well. He has described changeable distortions of the duodenal bulb which were the crucial manifestation in duodenitis in contrast to the constant distortions of duodenal ulcer. His cases were pathologically proved by cellular infiltration in the duodenal walls. This was so critically done that he accepted only a limited number of cases as proved. Duodenitis is not used too freely as a diagnosis. Hypermotility and rapid emptying of the bulb can be responsible for erroneous diagnoses of duodenitis.

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